

# Reconsidering Tree Fruit as Candidate Crops Through the Use of Rapid Cycle Crop Breeding Technologies

Presented by:

**DR. THOMAS GRAHAM**  
NASA Post-Doctoral Fellow  
Kennedy Space Center



AgroSpace May 22-23, 2014



# Overview

- Dwarfing work at KSC
- Tree Crop Exclusion
  - Architecture; Juvenility; Dormancy; Harvest Index
- FasTrack™ Crop Breeding System
  - *Prunus domestica* (plums)
- Tree Crop Inclusion
- Current State of Development
- Q & A



# Dwarfing Work at KSC





Root Restriction



Blue Light GA  
Inhibition



# Tree Fruit Incompatibility



Architecture



AgroSpace May 22-23, 2014



# Tree Fruit Incompatibility



Dormancy

Photo by: Connie Painter



AgroSpace May 22-23, 2014





# Tree Fruit Incompatibility

Juvenillity



P  
l  
a  
c  
e  
h  
o  
l  
d  
e  
r

AgroSpace May 22-23, 2014





# Tree Fruit Incompatibility

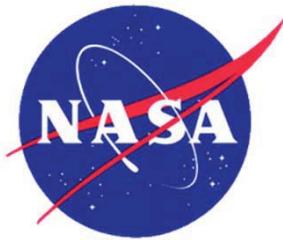
Harvest Index

Placeholder



AgroSpace May 22-23, 2014





Candidate crops restricted to herbaceous crops

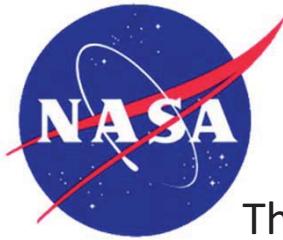


Tree fruit crops **could** contribute significantly to health crew diet and other ALS objectives...

Tree fruits precluded based on:

- Stature/size
- Long maturation phase
- Dormancy requirements
- Harvest Index





The challenge is...

Develop tree fruit cultivars that conform to the requirements of spaceflight and planetary exploration life-support systems



AgroSpace May 22-23, 2014





# FasTrack™ Breeding System

US Patent 8,633,354 B2

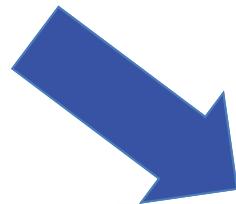
Developed by USDA (Kearneysville, WV)

- Breeding disease resistance
- Breeding better traits
- Stay ahead of disease

Flowering Locus T Gene –  
*Populus trichocarpa*



*Prunus domestica*





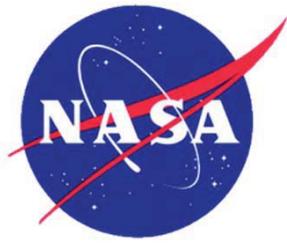
# Incompatibilities

- Architecture
- Dormancy
- Juvenility
- Harvest index



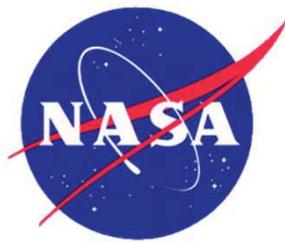
# Become Compatibilities





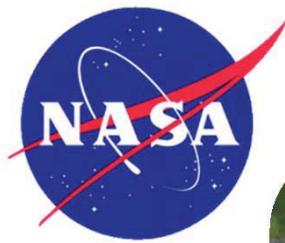
AgroSpace May 22-23, 2014



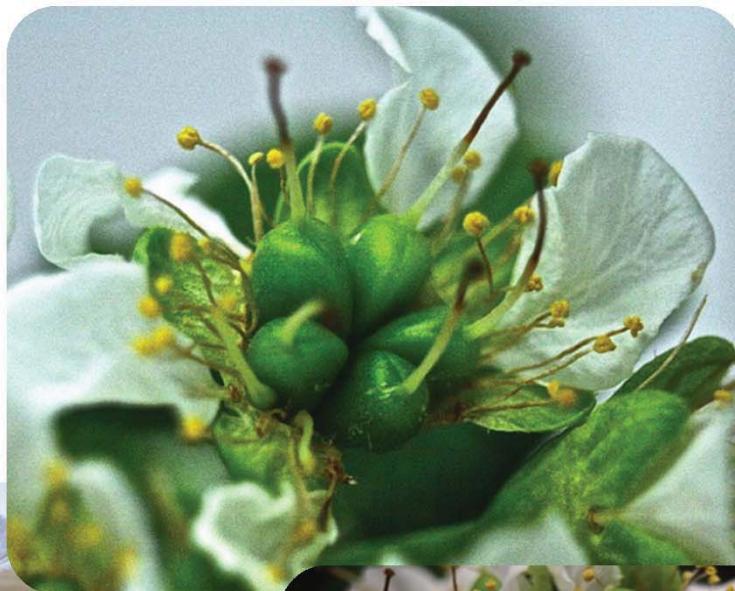


AgroSpace May 22-23, 2014





AgroSpace May 22-23, 2014





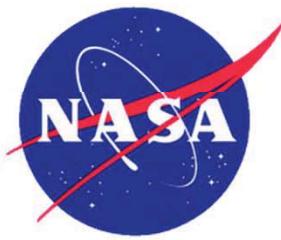
# Potential Benefits & Outcomes

- Improved crew diet/nutrition (functional foods)
- Bone loss prevention/countermeasure
- Radiation countermeasure
- Water filtration
- ISRU
- System carbon capacitance
- Biomaterials & fibers



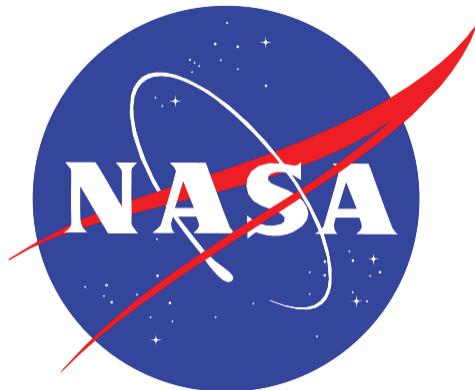
AgroSpace May 22-23, 2014





AgroSpace May 22-23, 2014





Dr. Raymond Wheeler (NE-S)  
 Dr. Thomas Graham (NASA NPP)  
 Dr. Gioia Massa (UA-B)  
 Dr. Gary Stutte (ESC)

Dr. Janelle Coutts (ESC)  
 Jeffrey Richards (ESC)  
 Lashelle Spencer (ESC)  
 Lawrence Koss (ESC)

## The Team



Dr. Anna-Lisa Paul  
 Dr. Robert Ferl



## Questions?

AgroSpace May 22-23, 2014



Dr. Ralph Scorza  
 Dr. Ann Callahan  
 Dr. Chris Dardick  
 Doug Raines

Dr. Brenda Smith

